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AN EXAMINATION OF THE SM -OPEN-ECONOMY HYPOTHESIS FOR CANADIAN EXPORTS

Benjamin W. Wurzburger

Research Department

The views expressed in this paper are those of the author; no responsibility for them should be attributed to the Bank.

CONTENTS

AVANT-PROPOS		i
INTRODUCTION		1
1	EXPORT PRICES	1
2	EXPORT VOLUMES	13
3	A CALCULATION RELATED TO THE "PESUDO-SMALL OPEN ECONOMY" HYPOTHESIS	19
CONCLUSION		22
REFERENCES		23

AVANT-PROPOS

Le Canada répond-il, en ce qui a trait au comportement de ses exportations, à la définition de la "petite économie ouverte"? Si tel est le cas, le prix des produits canadiens d'exportation (exprimé en devises étrangères) doit être déterminé par l'évolution de la conjoncture à l'étranger et ne dépend en rien de facteurs internes. De même, si l'hypothèse du petit pays est juste, l'évolution des exportations canadiennes à prix constants doit être déterminée par une courbe d'offre, laquelle comporte des implications qui peuvent être vérifiées empiriquement.

Cette étude est divisée en trois parties. Dans la première partie, l'auteur analyse les facteurs à la base de l'établissement des prix à l'exportation et en arrive à la conclusion que l'hypothèse de la "petite économie ouverte" décrit adéquatement le comportement des prix des produits canadiens à l'exportation. Dans la deuxième partie, il élabore un modèle d'exportations à prix constants applicable à une petite économie ouverte et en arrive à la conclusion que les données relatives aux exportations en volume ne vont pas dans le sens de l'hypothèse. Enfin l'auteur fait à la troisième partie un exposé de certains calculs relatifs à l'hypothèse d'une "pseudo-petite économie ouverte."

INTRODUCTION

Does Canada obey the "small open economy" paradigm in its export behaviour? If the small-open-economy paradigm holds, the price of Canadian exports (measured in foreign currencies) is determined by foreign developments with no impact from domestic developments. Also, if the small country assumption is valid, the volume of Canadian exports can be appropriately modeled via a supply curve with its testable implications.

This paper is divided into three sections. In Section 1, I discuss the determination of export prices and find that the small-open-economy hypothesis accurately describes Canadian export prices. In Section 2, I develop a model of export volumes relevant for a small open economy and find that the data on export volumes do not support this hypothesis. Finally, in Section 3, I present a calculation related to the "pseudo-small open economy" hypothesis.

1 EXPORT PRICES

1.1 Models of Export-Price Determination

Both the Scandinavian model (e.g., Branson and Mhyrman, 1976) and the monetarist model of a small open economy begin with the division of the economy into two productive sectors; the traded-good sector and the nontraded-good sector. The traded-good sector produces commodities that are traded on world markets, i.e., exportables and import-competing goods, and this sector is assumed to be a price taker. In the monetarist model a devaluation improves the trade

balance by increasing the price of tradeables, which results in an excess supply of tradeables.

Let PX be the price of exports (measured in Canadian dollars), PUS the world (for our purposes the United States) market price (measured in foreign currency), and PFX the exchange rate (C$ per unit of foreign currency). If the traded-good sector is a price taker, PX is determined as follows:

$$PX = PUS*PFX. \qquad (1)$$

The traditional model of international trade theory (e.g., Caves and Jones, 1973, p. 378) assumes a different disaggregation of goods than traded and nontraded, namely exportables and importables. Shinkai (1973) has constructed such a model with two goods, domestic products (which include exports) and imports. The country is assumed to be a price taker for imports but to have monopoly power in exports, whose price elasticity of demand is less than infinite. Ultimately, as recognized in the literature, this model is only suitable for a "pseudo-small" country (the terminology is from Swoboda, 1975, p. 33) which is too small to influence the world price of its import good but large enough to influence the world price of its export good. The possibility of such countries relies on the assumption that countries tend to concentrate more in exports than in imports and, in support of this assumption, Shinkai cites Michaely's (1962) empirical findings.

Shinkai assumes that the monopolistic country[1] sets the price of exports equal to the price of domestic products, PD. We note that within this model a devaluation is efficacious because it worsens the terms of trade, which improves the trade balance provided the Marshall-Lerner exchange market stability condition is satisfied.

According to the traditional model, export prices are determined as

$$PX=PD. \qquad (2)$$

The general price model, where the exporting country is neither a complete price taker nor a complete price setter, may be written

$$\ln (PX) = b \ln (PUS*PFX) + (1-b) \ln PD, \quad 0 < b < 1 \qquad (3)$$

My estimated equation validates model (1), the small-open-economy model.

1.2 Remarks on the Data

Export prices, PX: The price of Canadian exports to the United States is analyzed later in this paper. As the dependent variable, we use the series "Paasche price index, 1971 = 100, domestic merchandise

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1. The important condition here is that the exporting country be relatively important in the market so that it enjoys monopoly power, not that an exporting firm take into consideration the fact that it does possess monopoly power. Indeed, the recent literature on customer-markets, producer-customer relationships, and implicit contracts indicates that a firm's realization that it possesses monopoly power is a factor tending to make prices (in the buyer's currency) rigid.

to the U.S.A. excluding motor vehicles and parts", a series first published in the Bank of Canada Review in May 1977. This export price variable differs from that in RDX2 (Bank of Canada, 1976), which utilizes what is essentially a Laspeyres' price index. The major attraction of the Paasche price index is that if prices are Paasche, volumes are Laspeyres' and additive, whereas Laspeyres' price indexes and the associated Paasche volumes do not enable us to meet the adding up volume constraints imposed in a national accounts framework. In a forecasting exercise, for example, it is very desireable that disaggregated volumes add up to the aggregate volume.

The major thrust of the export-price estimation lies in testing whether Canadian export prices are determined by foreign prices or by domestic prices. In its construction of the Canadian export and import price indexes, Statistics Canada uses specification indexes as well as unit values - (specification indexes are prices quoted for a detailed commodity specification). Statistics Canada does not directly survey all the export specification price indexes but instead often derives these indexes from Canadian Industrial Price Indexes (ISPI). Prima facie, the construction of export prices from a Canadian ISPI will bias the test towards estimating a higher weight on Canadian prices and a lower weight on foreign prices. A counter-vailing bias towards estimating a higher weight on U.S. prices arises because, in the construction of the ISPI itself, Statistics Canada often does not survey Canadian prices but simply takes the U.S. price and corrects by the prevailing exchange rate.

The price of domestic products, PD: For simplicity, I assume

that imports are not sold directly but are first incorporated into domestic products. In that case, the price of domestic products will be the deflator for domestic demand. We create the domestic-demand deflator in terms of RDX2 variables as (YGPP - X$ + M$)/(UGPP - X + M), where YGPP(UGPP)) is nominal (real) gross private business product and X (M) represents exports (imports) of goods and services.

The foreign price of the traded good, PUS: Since I am modeling the price of exports to the United States, I assume that the United States imports the same aggregate commodity from Canada as from the rest of the world. Thus PUS will be m$/m, where m is the U.S. national accounts series, U.S. imports of goods and services. Because of ease of data accessibility, the U.S. series I use are seasonally adjusted while the Canadian series are not. This should not represent a serious problem because U.S. imports have a high (raw) commodity content and the seasonal factor in, say, copper prices cannot exceed the low carrying costs (including interest costs). (The argument that individual unadjusted prices can only contain a low seasonal component does not extend to the Paasche price index, for an individual commodity with an extreme price relative might be, in volume terms, very seasonal giving the aggregate Paasche deflator a high seasonal component.)

1.3 Empirical Results

The following equation has been estimated, OLS 2Q68-4Q75, t-statistics in brackets. The sample period was selected because of data availability. J1L represents the one period lag operator.

$$\ln (PX) = 3.2 + .67 \ln (PUS * PFX)$$
$$\quad (7.8) \quad (7.6)$$
$$+ .005 \ln (PDD) + .31 \, J1L \ln (PX) \qquad (4)$$
$$(.04) \quad (3.4)$$
$$see = .020 \quad dw = 2.04 \quad RB2 = .995$$

The long-run partial elasticity of export prices with respect to both foreign prices and the exchange rate is .67/(1-.31) = .97, while the elasticity with respect to domestic prices is .005/(1-.31) = .007. The estimated coefficients support the price-taking hypothesis.

Does the empirical result imply that the Canadian export sector acts as a price taker? It could be objected that if there were only one traded good, and both commodity arbitrage and the law of one price held so that tradeable-goods prices exhibited purchasing-power parity, then PX would be identical to PUS*PFX, and a regression would automatically find b, the coefficient on the foreign-price term, equal to 1. In principle, it might also be the case that Canada set the price of traded goods and other countries followed Canada's lead and it would therefore be incorrect to conclude from an estimated b of 1 that Canada is a price taker.

I believe that the objection raised in the above paragraph does not present a serious problem. First, if there were only one tradeable good in the world economy, we could legitimately be quite certain that Canada, a relatively small part of the world, would indeed be a price taker. Second, there is in actuality more than one

traded good. Since the mix of Canadian exports to the United States is not the same as the mix of aggregate U.S. imports, the law of one price on individual commodities does not ensure that, on aggregate indexes, the estimated value of b will be 1. Third, recent research (Isard, 1977) has indicated that the law of one price does not necessarily hold even on disaggregated data. The important point of the reported regression is that it provides as much evidence as can be obtained from a regression that Canada is a price taker.

1.4 Sources of Bias Within the Regression Framework

Because a high fraction of U.S. imports (approximately 20 percent) are from Canada, the variable PUS is not exogenous to Canadian export prices. The variable is in principle a weighted average of PX/PFX and PUSRW, where PUSRW is the U.S. price for goods imported from the rest of the world, excluding Canada. Hence, in regressing the variable PX on PUS*PFX, I am committing the sin, if it be a sin, of regressing a partial identity, and the estimated coefficient will overestimate the true impact of exogenous (not from Canada) U.S. import prices, thereby biasing the estimated coefficient on PUS*PFX towards unity. I therefore re-estimate equation (4), replacing PUS with a constructed series PUSRW. Since the U.S. National Accounts do not provide a series "real U.S. imports from Canada", the construction of a series for PUSRW necessitated several assumptions and approximations. The following equation is then estimated.

$$\ln (PX) = 2.8 + .04 \ln (PDD) + .55 \ln (PFX*PUSRW)$$
$$\quad (6.1) \quad (.3) \quad (5.9)$$
$$+ .41 \text{ J1L } \ln (PX) \qquad (5)$$
$$(4.2)$$

see = .023 RB2 = .993 dw = 2.13

The coefficient on the foreign-price term and the RB2 are both lower in (5) than in (4) as we move away from the identity that relates Canadian exports to the United States to imports from Canada. While PDD enters somewhat more in (5) than in (4), both its estimated coefficient and t-statistic remain very small. Purging the U.S. import price deflator and introducing the unaesthetic PUSRW does not materially alter the estimated coefficients.

Another potential source of bias towards estimating an unwarrantedly high coefficient on the foreign-price term would arise if the rate of technical progress in the traded-goods sector is highly correlated with the world rate of technical progress in the traded-goods sector. In this case the variables PX and PUS may be highly correlated, although there may be no direct causal relationship between them.

1.5 The Currency-Contract Problem

According to equation (4), PX is determined in the long run by PFX*PUS; the specification assumes as a maintained hypothesis that PUS and PFX affect the Canadian dollar selling price with the same adjustment lag. According to Caves and Reuber (1971, p. 207), on the other hand, "The stability (in other words, inelasticity) of

expectations about the exchange rate ... contrasts with expectations about movements in the general price level ..." While Frenkel (1976, p. 211), discussing the German hyperinflation, provides evidence that the spot exchange rate and the previous period's forward rate moved in close tandem, such evidence says little about the instability of expectations in a non-hyperinflationary environment. Throughout the recent slide of the Canadian dollar, for example, the forward market has consistently overpredicted the future value of the Canadian dollar. Moreover, even if exchange-market participants displayed elastic expectations, commercial producers might very well be less sophisticated and display inelastic expectations.

Consider a Canadian exporter who denominates contracts in Canadian dollars. When the order is accepted, the two parties may be regarded as implicitly forecasting the future (delivery) values of PFX and PUS, thereby setting PX. The actual delivery values of PUS and PFX will differ from the forecast values. Following Caves and Reuber's general statement about the formation of expectations about exchange rates and prices, PX should respond less rapidly to PFX than to PUS.

One easy way of incorporating the phenomenon of differential speed of response to the exogenous variables is to add a term J1P(PFX) to the right-hand side of equation (4). The term J1P(PFX), the percentage change in PFX, is approximately 100(log PFX - J1L(log PFX)). If PX responds less rapidly to PFX than to PUS, the coefficient on J1P(PFX) should be negative. In re-estimating (4), I omit the ln(PDD) term, a term insignificant in (4), and observe that

$$\ln(PX) = 3.14 + .66\ \ln(PFX*PUS) - .0044\ J1P(PFX) + .33\ J1L\ \ln(PX) \quad (6)$$
$$(7.8)\quad (8.6)\qquad\qquad (-1.3)\qquad\qquad (3.8)$$

see = .019 RB2 = .995 dw = 2.13

The estimated impact elasticity of PX with respect to the exchange rate is .66 - 100*.0044 = .22. This number is probably an underestimate. If, as an educated guess, 50 percent of Canadian exports are denominated in U.S. dollars[2], and there is a one quarter lag from contract to delivery (see Magee 1974, p. 162), then the impact elasticity of PX with respect to PFX should be at least .5 as the increase in PFX automatically increases the Canadian dollar price of those contracts already denominated in U.S. dollars.

The specification of equation (6) constrains the long-run exchange rate elasticity to equal the long-run U.S. price elasticity. (The long-run elasticity is estimated at .66/(1-.33) = .99, a value almost identical to the value of 1 implied by the price-taking model.) To test this constraint, I re-estimated equation (6), splitting the ln(PFX*PUS) term into two terms, ln(PFX) and ln(PUS), and thus generated the following estimate:

$$\ln(PX) = 3.2 + .68\ \ln(PUS) + .71\ \ln(PFX) - .0045\ J1P(PFX) + .32\ J1L\ \ln(PX) \quad (7)$$
$$(7.3)\quad (7.6)\qquad\qquad (3.8)\qquad\qquad (-1.4)\qquad\qquad (3.3)$$

see = .019 RB2 = .995 dw = 2.12

2. Unfortunately no precise data are available for the Canadian case. For some relevant observations on the currency of contract, see Fieleke (1971, p. 187) and Grassman (1973, p. 105).

1.6 Comparison with the RDX2 Export-Price Equation and a Dornbusch-Krugman Equation

My estimated equation assigns the foreign price a major role, in contrast to the RDX2 estimate which assigns foreign prices a minor role. My estimate differs from the RDX2 estimate not only because of of the different specification but also because of a different sample period and export-price series. To highlight the differences in specification, I re-estimated the RDX2 specification using the same dependent variable and sample period as in (6).

The RDX2 specification, originally estimated over the period 1958-1972, generates the following result when estimated over the sample period 1968-1975.

$$\ln(PX) = \underset{(3.5)}{3.49} + \underset{(4.6)}{.71}\ln(PGPP) - \underset{(2.5)}{.69}\ln(PXBNF2*PFX) + \underset{(8.6)}{.93}\,J1L\ln(PX) \qquad (8)$$

see = .28 RB2 = .990 dw = 1.85

PGPP represents the "price deflator for gross private business product" and PXBNF2 the "implicit price deflator for U.S. nonfarm business product and household output." The RDX2 specification generates a perverse sign on the PFX term, an indication of serious specification error. One specification error is the use in RDX2 of an inappropriate U.S. price variable, as opposed to my choice of PUS.

Since PXBNF2 is a value-added deflator and not a price, an increase in U.S. import prices may initially lower PXBNF2 as U.S. corporations initially absorb the higher import prices. This initial absorption is apparent in the estimated PXBNF2 equation in the MPS model (Federal Reserve Board, 1973) where an exogenous increase in the import price of raw materials initially lowers PXBNF2.

The poorer statistical fit obtained with the RDX2 specification, its perverse sign on the PFX term, as well as other preliminary experimentation, suggest that my choice of PUS for the foreign price term is a reasonably good choice for the variable. The choice of PUS can be criticized because it assumes, counterfactually, that there exists only one traded good in the world economy. In fact, the imposition of a banana cartel will raise aggregate PUS, U.S. import prices, but it will not raise Canadian export prices. Nevertheless, the export-price boom has been strikingly widespread across commodity classes which suggests that the concept of an aggregate world traded good is a fruitful one. While interesting tales can be told about many of the individual commodities, I believe, following Cooper and Lawrence (1974), that many common factors influence export-price behaviour.

Dornbusch and Krugman (1977) have also estimated an equation for Canada's unit export value for manufactured goods. Their explanatory variables, Canadian "standard unit labour costs" and "competitors' prices", enter with approximately equal coefficients. The Dornbusch-Krugman sample period, 1960-1972, omits the post-1972 commodity boom experience and one must wonder how sensitive their

results are to this omission.

2 EXPORT VOLUMES

If Canada satisfies the small-open-economy paradigm and takes export prices as exogenous, the volume of Canadian exports is determined via a supply curve. To test whether the supply-curve analysis represents an appropriate paradigm, I develop a model of supply-curve, price-taking behaviour and examine the implications concerning export volumes. These implications contradict the historical experience, indicating that the supply-curve approach is not the relevant model. In particular, the ratio of real exports to GNE was lower in 1976 than in 1971 despite the higher (export price)/(GNE deflator) ratio and despite the capital deepening which, I shall argue, should have stimulated the production of exports.

2.1 The Model

In this section, I develop some testable implications of the price-taking model within the framework of the neoclassical two-sector equilibrium model. Assume a two-sector production model, one sector producing exportables, the other sector producing nonexportables. Let XA denote the production of exportables, XN the production of nonexportables, PXA and PXN the prices of exportables and nonexportables, and LXA, LXN, KXA, KXN, the labour and capital utilized in these two sectors. Let L and K denote the total predetermined availability of labour and capital, and let R = PXA/PXN, the price of exportables relative to non-exportables. Let the

production functions be f(LXA, KXA) and g(LXN, KXN) - following standard analysis, I do not explicitly consider raw materials as a scarce factor of production. In the neoclassical tradition, I assume full utilization of both labour and capital (abstracting from Keynesian insufficient demand problems) and also assume that both capital and labour are fully mobile between sectors (neglecting the questions of putty-clay technology and gestation periods). While the assumptions of full factor utilization and mobility are obviously invalid for the short run, the assumptions are less deleterious within the context of medium- and long-run analysis. Under the standard assumptions for perfect competition, factors will be allocated between sectors so as to solve the following maximization problem:

maximize f(LXA, KXA)*R + g(LXN, KXN), subject to LXA + LXN = L, KXA + KXN = K.

L, K, and R are the exogenous total labour, total capital, and relative product price. The solution to the two-sector model maximization problem displays the following properties:

(i) df/dR exceeds 0.

(ii) If, and only if, KXA/LXA exceeds KXN/LXN, then df/dK exceeds 0 (Rybczynski theorem).

That is,

(i) that an increase in the relative price of exportables will induce the productive sector to move along the production-possibility frontier and shift factors from the "other"

sector to the exportable sector.

(ii) that if the exportable sector is the capital-intensive sector (an assumption that I justify empirically), an increase in the capital stock endowment will increase the production of exportables. One interpretation of the operative mechanism is that an increase in capital stock raises the (shadow) wage/rental ratio and thereby discourages the production of goods with a high labour content.

For my purposes, it is more convenient to deal with intensive variables. Let Q be total production and xa = XA/Q, the ratio of exportables to total production. It seems likely that, using logic similar to that used in the proof of (i) and (ii), the ratio of exportables to total production may be written

$$XA/Q = xa = h(R, K/Q) \qquad (9)$$

and that dh/dR and dh/d(K/Q) are both positive. An exogenous increase in the relative price of exportables will raise the share of exportables in total production, as will capital deepening, an increase in the capital/output ratio.

So far, I have developed a theory concerning the production of exportables. My ultimate interest lies in creating a testable hypothesis about the volume of exports. The volume of exports, X, equals the production of exportables, XA, less the net domestic absorption of exportables, XC. In intensive form with lower case variables denoting the share in output (income),

$$x = xa - xc. \qquad (10)$$

Standard demand theory sets xc as a decreasing function of the own relative price, R. Hence, not only is xa an increasing function of both R and K/Q but so is x. The ratio of exports to output should, according to the two-sector model, be an increasing function of the relative price of exports to output as well as an increasing function of the capital/output ratio.

2.2 The Export Sector is the Capital-Intensive Sector

Because Canada enjoys a higher aggregate capital/output ratio than the United States, its chief trading partner, the two-factor Heckscher-Ohlin trade model predicts that the export sector is the capital-intensive sector. A more applied analysis would emphasize that since Canadian exports are heavily resource based and the exploitation of natural resources is a capital-intensive activity, the export sector will likely be capital intensive.

I have calculated, using tables I-A and II-A in Postner (1975) which are based on input-output data, that in the export sector each dollar input of labour flow (direct and indirect labour) requires $3.33 of fixed capital stock (direct and indirect), while in the aggregate economy each dollar input of labour flow required $2.70 of fixed capital stock as an input (1970 data, annual basis, based on 1961 relative prices). The export sector is indeed more capital intensive.

2.3 The Facts

The price-taking, supply-curve model predicts that an increase in the relative price of exports and an increase in the capital/output ratio will lead (after a possible lag) to an increase in the share of GNE devoted to exports.

The following table summarizes the evolution of the relevant variables over the period 1971-1976, a period chosen because of data availability.

	1971	1976	Ratio 1976/1971
Exports of goods and services, millions of 1971 dollars. Source: Bank of Canada Review, Table 53	22,181	26,060	1.17
GNE, millions of 1971 dollars Source: Ibid	94,450	118,484	1.25
Implicit price index, exports of goods and services, 1971=100. Source: Ibid, Table 54	100.0	174.1	1.74
Implicit price index, GNE, 1971=100. Source: Ibid	100.0	160.4	1.60
Mid-year net stock fixed capital, total manufacturing and non-manufacturing industries, millions of 1971 dollars. Source: Statistics Canada Catalogue 13-211, "Fixed capital stocks and flows", page 1, and unpublished Bank of Canada data.	171,227	218,705	1.28

Violating the prediction of the price-taking supply model, the ratio of real exports to GNE fell by 7 percent over this period despite a 9 percent increase in the relative price of exports and a 2 percent increase in the capital/output ratio. This negative relationship between volumes and prices is characteristic of movements along a demand curve, not of movements along a supply curve.

2.4 Export Volumes and the Small-Open-Economy Paradigm: Disaggregated Evidence from a Comparison of the Laspeyres' and Paasche Price Indexes

The preceding analysis demonstrated that the historical behaviour of aggregate exports violates the prediction of the small-open-economy hypothesis, because the increase in the relative price of exports failed to elicit an increase in the volume of exports. I now present another non-parametric test to examine the volume-supply response, a test that refers to micro export-supply functions.

If Canada satisfied the conditions of a small open economy, the ratios of export prices will be determined via external developments, the volume of individual Canadian export categories will be determined via Canadian micro-supply functions, and Canadian suppliers will supply relatively more of the export good whose relative price has increased. (Formally, this assertion requires that shifts over time in the production-possibility frontier be homothetic.) Now, if relative volume movements are positively associated with relative price movements, the Paasche price index will exceed the Laspeyres' price index.

Statistics Canada catalogue 65-001, supplement, December 1976, reports that the Paasche export price index (1971 = 100, all sections, all countries) stood at 176.2 in 4Q76 while the corresponding Laspeyres' price index stood at 184.1. The phenomenon that the Laspeyres' price index exceeds the Paasche contradicts the prediction

of the small-open-economy model.

3 A CALCULATION RELATED TO THE "PSEUDO-SMALL OPEN ECONOMY" HYPOTHESIS

As discussed in Section 1, an alternative model to the small-open-economy hypothesis, a model appropriate for a country that is small enough to be a price taker in its imports but large enough to influence the world price of its exports, is denoted as the "pseudo-small economy assumption." Frenkel (see Shinkai, p. 962) points out that this pseudo-small economy assumption may be justified for a rather large group since countries tend to specialize more in exports than in imports. (The assumption that countries act more as price takers in imports than in exports may also be generated if export supply elasticities, with respect to price, tended to exceed import demand elasticities.) I now calculate the weighted average of the ratios of disaggregated Canadian exports to U.S. production and compare that figure with the weighted average of the ratios of disaggregated Canadian imports to U.S. production. I thus determine whether the weighted market share held by the Canadian export sector exceeds the corresponding "buyer's share" held by the Canadian import sector.

Let U(i) denote U.S. production of the ith category, X(i) Canadian exports to the United States, and M(i) Canadian imports from the United States. Then the weighted average of the Canadian exporter's market share, WAX, is

$$WAX = \frac{1}{\Sigma X(i)} \Sigma X(i)\frac{X(i)}{U(i)} \qquad (11)$$

while the corresponding weighted average import share, WAM, is

$$WAM = \frac{1}{\Sigma M(i)} \Sigma \frac{M(i)M(i)}{U(i)} \qquad (12)$$

Note that under the coarsest partition (no disaggregation), WAX reduces to $X(i)/ U(i)$, the ratio of aggregate Canadian exports to aggregate U.S. production. It can also be shown that the finer the partition (the greater the degree of disaggregation), the higher the value of the weighted averages, WAX and WAM.

Exports (and similarly imports) may be divided into the export of raw commodities and the export of value added in manufacturing and processing. If one wished to examine whether the exporters of raw commodities had an impact on the world price, a disaggregation of exports along commodity lines would be appropriate. On the other hand, an analysis of the exports of value added calls for a disaggregation along industry lines.

Because the calculations are easier, I examine a disaggregation along industry lines, in particular the SIC 2-digit disaggregation of the manufacturing sector. Data from 1974 are used. The amount produced in the United States, U(i), is represented by the value of U.S. industry shipments (source - Annual Survey of Manufacturers, 1975). The values of Canadian exports and imports to and from the Unied States, X(i) and M(i), are taken from OECD data which are on the SITC basis (source - OECD series C). The concordance between SITC and SIC classifications follows that presented in Gruber and Vernon (1974). Following Gruber and Vernon, I disaggregate SIC industry 33,

primary metal industries, into a ferrous and a non-ferrous industry, and also exclude SIC industries 39, miscellaneous manufacturing industries, and 19, ordnance. The results are listed in the following table.

	Coarsest Partition	2-digit SIC Partition	Ratio of Finer to Coarsest Partition
WAX - Average Canadian Export Concentration in U.S. Market	.016	.035	2.2
WAM - Average Canadian Import Concentration Relative to U.S. Market	.017	.033	1.9

Under the coarsest disaggregation, where the manufacturing sector is aggregated into one industry, WAM marginally exceeds WAX, as aggregate manufactured imports marginally exceeds the corresponding exports. As we move to the 2-digit partition, the export concentration measure, WAX, increases by a factor (2.2) only somewhat higher than the factor (1.9) by which the import index increases. I have failed to find significant evidence that Canada specializes more in its exports of manufactured goods than in its imports.

CONCLUSION

Empirical testing showed Canada to be a price-taker in its export

pricing because the aggregate price of Canadian exports to the United States (measured in United States dollars) is determined by foreign developments. Additional tests also revealed that the movements in the volume of Canadian exports do not correspond with the predictions of the price-taking, supply-curve model. The first result supports the applicability of the small-open-economy model but the evidence from the volume side contradicts this model. Mixed evidence is non-corroborative and the small-open-economy hypothesis should be embraced with caution. Although it is certainly valid for certain export categories (homogeneous commodity, low transport costs, Canada relatively unimportant producer, no barriers to trade), the model does not appear adequate for aggregate Canadian exports.

A competing model, the "pseudo-small" economy assumption, draws its claim for empirical relevance from the contention that countries tend to specialize more in their exports than in their imports. I tested this assertion for the case of Canadian trade with the United States and failed to find evidence of Canada concentrating more in its exports than in its imports.

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